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CRITICISMS AND DISCUSSIONS.

THE PROBLEM OF TIME.

PHYSICS VS. METAPHYSICS.

The great St. Augustine, Bishop of Hippo, in Africa, writer and theologian, the celebrated French prelate and writer, Fénelon, and Kant, greatest of German metaphysicians, all believed that time is stationary ; that it does not, with relation to the transitoriness of matter, begin, pass, and end with relation to events. Respectively, in Latin, French, and German, they bequeath to us their lucubrations on the subject, St. Augustine at one time so puzzled and distraught about the mystery, as he deemed it, that he besought heaven for enlightenment.

But let us take a simple case, as illustrative of the point to be established in the course of the demonstration here intended, that, on the contrary, time is not stationary, that it passes with the transitoriness of other things.

For the convenience of round numbers, let us imagine a locomotive in motion, aboard the train of which a passenger is speeding away for a mile, at the rate of sixty miles an hour, a mile a minute, exactly eighty-eight feet a second. Let the locomotive's whistle blow a continuous blast during the minute passed while the mile is traveled. The passenger perceives the sound to be of the same pitch throughout the whole distance. But let him, on the contrary, stand beside the railway while a locomotive rushes by under the same conditions of speed and sound. He no longer perceives the pitch of the whistle to be the same throughout the course of the mile. He hears its pitch, when the whistle is near him, as a shriek or yell, but as it continues to sound, with the rapidly departing train, he hears it successively as a roar, a groan, and a moan. Then, with distance, comes silence.

The pitch of every note, natural or artificial, depending upon the greater or smaller numbers of vibrations acting on the drum of the ear, the greater the number of vibrations produced by a resonant body is, the higher the pitch of the resultant note; the smaller the number, the lower the pitch. The highest pitch perceptible by the human ear is of 38,000 vibrations, the lowest, only 16. The listener standing near the locomotive, under the circumstances described, hears, as has been mentioned, the same note, first as a shriek or yell, then as a roar and a moan, its natural pitch affected by time and distance, lowering it in effect, to the listener's ear until silenced by distance. This happens because, as the whistle rapidly increases its distance from the listener, the vibrations are spread out, so to speak, through the effect of lapsing time over increasing distance. The velocity of sound, unlike that of light, which is instantaneous for all but celestial distances, requiring considerable time to reach a given point (a second,—temperature 60.8° Fahrenheit,—for every 1115.4 + feet), and the whistle's rate of departure from the listener at the railway's side being eighty-eight feet per second, only a portion of the normal vibrations per second of its pitch reach his ear, and these, in consequence, represent lower notes.

This is the fact, open to the observation of the least acute observer, and such as it has often been scientifically described. Being the fact, it completely disproves the theory that time is stationary, and that only matter and events, as the general condition of other phenomena, are fleeting. Assume, however, for the sake of argument, that time is stationary, and we shall clearly perceive, by comparing a consequence of that theory with the conclusion just reached, how ill it stands the test.

Time, then, we will concede, for the sake of argument, is stationary. If it be so, then, as before, the passenger aboard of the supposititious railway train going one mile a minute, eighty-eight feet a second, while its locomotive blows a continuous blast from its whistle, hears the true pitch of the whistle from the beginning to the end of the prescribed mile. This, therefore, occurs as it occurred before, under the condition that the listener is aboard the train. This test, therefore, does not conflict with the theory that time is stationary. Whether time be stationary or moving, the listener must, under these circumstances, hear the whistle at its true pitch, for he is accompanying it with the same effectiveness of hearing its true pitch as though he should stand by the railway's side at the moment when the blowing whistle passes.

But, mark, upon the theory that time is stationary, he would also hear, throughout the whole course of the mile, the true pitch of the whistle, even if he should stand at the railway's side. For, by the theory that time is stationary, there could be no lapses to his ear in the whistle's vibrations. Time being stationary, as the theory requires, the vibrations would reach him with the full number due to the whistle's normal pitch. The theory implies that time is indivisible, and therefore, that sonorous vibrations cannot be affected in transmission by the circumstance that their source is being whirled away through space, requiring, as science says, lapse of time, but, as the theory says, none. According to the theory, there is no relation of time to motion, and incidentally, to sound; for, if time be stationary, it cannot relate by action to any of its contents in the coexisting universe. That, as shown, it does not, according to the theory, harmonize with one of its contents; that it is, with relation to it, purely negative, is proof that it is not stationary. If time be stationary, the train passes through it without other relation to it than passage, which makes time's relation to it negative; but if time be moving, it accompanies the train, and its relations to any train's passage, or other motion of matter, whether relatively to it or to human observation of it, may be infinite. In the particular case before us, the relation, upon the hypothesis that time is moving, is fixed in various of these relations, notwithstanding that it is supposed to be moving, but, upon the hypothesis that time is stationary, there can be no correspondence between it and any movement in space.

So much may be said concretely, for the most part, in the case presented. It may, however, prove interesting to add the following word of pure generalization.

If time were, according to the theory, a something steadfast, through which all other things pass, instead of being a something which passes with them, it must be, as has been already mentioned, something indivisible. If it is not resolvable into units divisible by the arbitrary units of distance employed by humankind, their measurements of the relations of time, distance, and motion are merely imaginary. If time be stationary, it must be absolutely incapable of resolution into parts, just as the infinitude of space is similarly unresolvable. If time were stationary, it would be the only thing in nature unchangeable, of all that the human mind perceives of created things. It is, however, only under the condition of imagining the universe to be destroyed, that time is justly conceivable as

also ceasing to exist; but certainly, if existing, not as ceasing to move. Kant, however, explicitly denies the proposition that time would cease with the abolition of matter and space. But it seems preposterous not to regard time as an integral portion of the universe, vanishing with matter and space.

We must not imagine, from the ease with which this case is disposed of, that the distinguished men cited, who held to be true the theory that time is stationary, were not men of mind. They had little opportunity to obtain knowledge of acoustics and of other branches of science, of which even schoolboys have nowadays a smattering. There was, in their times, ancient down to modern, no Helmholtz, with his brilliant discoveries and teachings about fundamental notes and overtones and sound generally. There were no locomotives, clanging by with furious whistling, whose departing sound would doubtless have led them to the discovery of what is so plain to us of longer experience. They were as earnest in the search of truth as are any men of this era. One cannot but sympathize with St. Augustine when, yearning to solve the question regarding time, he burst forth into prayer as he wrote on the theme: "My mind burns to understand this most mysterious enigma. I do not desire to conceal, O Lord, good Father, in the name of Christ I beseech, I do not desire to conceal my longing. . . ."

Thus St. Augustine, in his ardor, interrupts from place to place in his works his discussion of the question as to time, reaching the conclusion that it is stationary.

Fénélon, in a most eloquent disquisition on the subject, reaches the same conclusion with St. Augustine. Kant is as diffuse on the subject as they, his summary being that the world generally receives the false impression of the movement of time from witnessing the decay of things. The Spanish theologian and metaphysician, Balme, remarks, in a note to his work, *Fundamental Philosophy*, that long before the Scholastics, the doctrine of the immovability of time had been taught by the most eminent authors, that Plato was not ignorant of this truth, that the Fathers of the Christian Church taught it, the Scholastics adopting the definition of Boëthius: That eternity is "An interminable and simultaneously perfect possession of life."

But, really, this definition conforms with an idea of time, whether regarded as a moving or as a stationary phenomenon. Eternity in the existence of anything, or of everything, is conceivable, and moreover, is actually conceived, as existence with

mutability save as to the soul. If science, through observation and experiment, recognizes, as it does, the indestructibility of matter and of energy in the universe, it may well hold as true the idea of time as moving, while recognizing, through observation, constancy in its course. Motion, in a word, not quietude, is the law of the universe, so far as observation and reason have detected and enabled mankind to judge of creation.

What vitiates the conclusion of St. Augustine, Fénelon, Balmes, and others regarding time is the concentration of their attention, not upon the pure and simple question as to whether or not time moves, but upon the maintenance of the eternal existence of God, which is not at all involved in the question. Consequent upon their conviction of this thesis, to the exclusion of everything else, they deem its corollary to be, that time is never past nor future, but always present; which is, of course, tantamount to believing that it does not move. The course by which they reach this conclusion from the postulate, that God is eternal, is the consideration that, were time moving, it would involve the consequence of admitting the possibility of the beginning and end of creation and creator. Therefore time, they conclude, must be ever present time. St. Augustine exclaims, speaking of eternity, "There, nothing is past, as if it no longer may be; nothing is future, as if it may yet be." Fénelon, in turn, exclaims, "But what does not pass, exists absolutely, and has but an infinite present." Fénelon, in the course of his long discourse on the subject of time exclaims, addressing God, "I always err whenever I depart from the present when speaking of you" [sic]. The fact is, that both St. Augustine and Fénelon wrote on the subject of time in religious ecstasy, which, in St. Augustine's case, takes the form of frequent recurrence to prayer, and in Fénelon's, that of a rhapsody throughout his treatise on the existence of God.

Father Buffier, on the contrary, treats the subject with what Balmes regards as levity. "It seems to me," says Father Buffier, "that these notions are as clear as they can be, and he who seeks to make them still clearer, is about as little intelligent as he who would like to make clear how twice two are four, and not five."

Haeckel, who professes himself a Pantheist, says, "Since Kant explained space and time to be merely forms of perception,—space the form of external; time, of internal sensitivity,—there has been a keen controversy, which still continues, over this important problem. A large section of modern metaphysicians have persuaded

themselves that this 'critical fact' possesses a great importance as the starting point of 'a purely idealist theory of knowledge,' and that, consequently, the natural opinion of the ordinary healthy mind as to the *reality* of time and space is swept aside. This narrow and ultra idealist conception of time and space has become a prolific source of error. It overlooks the fact that Kant only touched one side of the problem, the *subjective* side, in that theory, and recognized the equal validity of the *objective side*. 'Time and space,' he said, 'have empirical reality, but transcendental ideality.' "

How can Haeckel say that Kant touched only one side, when his own quotation from Kant defines both sides, and Kant says much more on the subject?

Although Kant does recognize time as known to common experience, he denies the *passage* of time when he tells us that we know it only through our perception of the decay of things. By both stating and implying that time stands still, he, of course, admits that time is real, but regards it only as a subjective reality, a form of human consciousness. Balmes, in his *Fundamental Philosophy*, remarks that Kant "asserts, without reason, that time in the things is nothing, and that it is only the form of our internal sense." As for Haeckel, he does not refer, in the quotation just made from his work on *The Riddle of the Universe* to the question as to whether or not time moves, but merely as to that of its empirical existence.

The fairest course to pursue is to select from Kant himself, among the numerous passages which he devotes to the subject, one that is conclusive as to his view. He says, "Our doctrine asserts, then, the *empirical reality* of time; that is, its objective validity in regard to all objects which may, on any occasion, be offered to our senses. And as our perception is at all times one of senses, there never can be given us an object in experience which is not submitted to the condition of time. But, again, we deny time all claim to *absolute reality*, if regarded as intrinsic condition inherent in things-in-themselves, irrespective of the form of our sensuous perception. Such attributes as belong to things-in-themselves can never be made known to us by the senses. In this, then, consists the *transcendental ideality* of time; which abstraction being made from the subjective conditions of sensuous perception, is absolutely nothing: and cannot be attributed to objects-in-themselves (or apart from their relation to our perception), whether as subsistent or inherent."

Further on, Kant answers objections made to this theory by persons who are not metaphysicians; but this passage from his

pen, in *The Critique of Pure Reason*, defining his view of time, will suffice for citation. It means, in sum, that time is a *phenomenon*, the appearance of an existence, and therefore, empirical; but that, of the corresponding *noumenon*, the thing-in-itself, we can have no knowledge.

But how is it consistent in Kant to deny, in one place, time as having any "absolute reality," to declare it an abstraction of sensuous perception, to be, in fact, "nothing," and yet, in another place, previously noted here, to regard it as the survival of a hypothetical abolition of matter and space? A *noumenon*, or thing-in-itself, is, in metaphysics, predicated of every *phenomenon*, or thing as it seems to be. But here Kant, in violation of metaphysical principles, defines the nature of the *noumenon*. He defines it too, as "nothing." How, then, if it be "nothing," would it endure as time, were matter and space to vanish? How, metaphysically, can a phenomenon have any existence without a corresponding *noumenon*? Can a *noumenon*, moreover, on those terms, be "nothing"?

To English readers such a discussion as the preceding might seem singularly incomplete, if it should ignore Locke, so I conclude with a brief statement of his view regarding time. He remarks: "There is another sort of distance, or length, the idea whereof we get, not from the permanent parts of space, but from the fleeting and perpetually perishing parts of succession. This we call *duration*, the simple modes whereof are any different lengths of it whereof we have distinct ideas, as *hours, days, years*, etc., *time* and *eternity*."

This expression makes it clear that Locke regarded time as moving, but, if more be needed, Locke's meaning is confirmed by Alexander Campbell Fraser, the editor of *An Essay Concerning the Human Understanding*, who, in a side-note to the passage quoted, prints, "Duration is fleeting extension."

The bounds mentally prescribed to this article have been reached. One might, with reason, had its dimensions been contemplated as broader, enter Hume and Leibnitz in the lists as contestants with regard to the essence of time, and going further, find a volume too small to include a history of the interminable war of ideas as to time, let alone those related to the questions of matter and space. Here, therefore, the limit has been reached which is practicable in a magazine for such a subject as that which has been here presented.

It seems to me, in summing up, that consideration of the previous discussion, coupled with due reflection upon the glimpse of creation

there afforded to sight, must bring conviction that time is not only real, but that it moves in profound compatibility with eternal motion in matter, from the myriad electrons streaming within the dancing atoms of agitated molecules, to suns so distant that they are far beyond even photographic vision of the earth. If an additional thought be permissible here, the question may be asked whether it is not credible that, as matter and energy, so far as we know them, are recognized as immortal, one may not rationally suppose that mind may survive. It may be answered, as if conclusively, that all energy, so far as we know it, is interchangeable in character, that nothing has been more conclusively proved than its constant *mutability* throughout the action of the correlation and conservation of energy. True, but the saving clause herein lies in the fact embodied in the words, "so far as we know," and justly, too, for discoveries in this department of knowledge have not ceased to the present day. It is conceived by many as probable, and by many more as certain, that there is a form of energy, not inextricably correlated to its generally recognized forms, variously termed mind or soul, through which, if so, the existence of Deity as its highest type is implied. Certain it is, that if one chooses to regard nature as wholly materialistic, a distinctly greater difficulty would seem to be thereby admitted by the question as to the possibility of its producing through evolution what is universally recognized as mind.

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MATHEMATICAL ANALOGY.

An article by Mr. McFarland in *The Monist* of October of last year, calls attention to a fruitful source of error in the reasoning of many people, who have picked up a knowledge of mathematics at second-hand, and think they can apply it to reasoning about the question of miracles or about moral problems. The whole mass of misleading speculation on this subject rests on two initial false assumptions.

1. There does indeed exist a connection between religious and mathematical doctrine; but the parallelism is not, as many suppose, between facts in the history of Palestine and curves drawn in Europe or America; but between two psychologic conditions. Any attitude